

This Page Is Inserted by IFW Operations  
and is not a part of the Official Record

## **BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning documents *will not* correct images,  
please do not report the images to the  
Image Problem Mailbox.**

## PATENT SPECIFICATION



Application Date: Jan. 15, 1941. No. 577/41.

544458

Complete Specification Left: Jan. 12, 1942.

Complete Specification Accepted: April 14, 1942.

## PROVISIONAL SPECIFICATION

## Improvements relating to Vehicle Window Operating Mechanisms

We, WILMOT-BREEDEN LIMITED, a Company duly incorporated under the Laws of Great Britain, of Eastern Works, Camden Street, in the City of Birmingham, 1, and ARTHUR SMYDE, a British Subject, of the Company's address, do hereby declare the nature of this invention to be as follows:—

This invention relates to raising and lowering mechanisms for vehicle windows, and has for its object to provide improved actuating means whereby the required movements can be obtained automatically, thus enabling the ordinary actuating handles to be dispensed with.

The invention comprises a raising and lowering mechanism having combined with it an electric operating motor, and switches for controlling the motor in response to manipulation by an occupant of the vehicle and movements of the mechanism.

In one application of the invention to a mechanism of the kind in which a lever or linkage system is adapted to be arranged beneath the lower edge of the window and has combined with it a toothed wheel or sector and pinion, we arrange a worm wheel in combination with the pinion. In engagement with the worm wheel is arranged a worm, and this latter is arranged in connection with an electric motor, the gear-ratio of the worm and worm wheel being such that the window mechanism can easily be operated by a small motor adapted to be mounted within the door or other part of the vehicle body carrying the window. The motor may be of the series or shunt wound type, and it may be connected to the worm by a rigid or flexible shaft.

Current is supplied to the motor from the vehicle battery through conductors concealed in the body of the vehicle, and the circuit is controlled by appropriate switches. One such switch is adapted to

be actuated by an occupant of the vehicle and may be mounted on the window ledge or on the dash board. In the latter case the switches for all the windows may be grouped together in a manner permitting any one of the windows to be actuated, or any two or more of them to be actuated simultaneously. Preferably each such switch is adapted not only to stop or start the motor but also to reverse the motor, and it may be of the lever or the push button type. To effect the opening of the motor circuit automatically at each limit position of the window, any convenient additional switch or switches is or are provided either in the window frame or in association with the raising and lowering mechanism.

With appropriate modification of details (if necessary) the invention can be applied to any of the window operating mechanisms ordinarily used on motor vehicles and not only to those employing link or lever systems, but also those employing friction, or chain and sprocket mechanisms.

Where it is preferred to arrange the conductors to pass through the hinged edges of the doors they may be protected by incorporating them with the door check straps. Otherwise contacts may be arranged on the door and frame edges, or in combination with the door hinges for interconnecting the parts of the conductors within the doors and the parts within the fixed body portions of the vehicle.

By this invention we are able to dispense with window operating handles within the interiors of vehicles and so obviate the well known disadvantages associated with such handles.

Dated this 13th day of January, 1941.  
MARKS & CLERK.

## COMPLETE SPECIFICATION

## Improvements relating to Vehicle Window Operating Mechanisms

We, WILMOT-BREEDEN LIMITED, a Company duly incorporated under the Laws of Great Britain, of Eastern Works, Camden Street, in the City of Birmingham, 1, and ARTHUR SMYDE, a British Subject, of the Company's

[Price 1/-]

Price 4s 6d.

address, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention has for its object to provide improved vehicle window operating means of the kind in which a reversible electric motor for imparting motion to a vehicle window is controlled by a hand operable switch and a pair of limit switches.

The invention comprises the combination of mechanism including a reversible electric motor and a link or lever system through which motion can be imparted to the window, a hand operable switch for directly controlling the supply of current to and the direction of rotation of the motor, and limit switches directly operable by the said mechanism for interrupting the supply of current to the motor when the desired movement of the window in either direction has been completed.

In the accompanying sheet of explanatory drawings:—

Figure 1 is a diagram illustrating one form of electrical means for use in carrying the invention into effect, Figure 2 is a diagram illustrating one form of window raising and lowering mechanism adapted to operate in accordance with the invention.

Figure 3 is a diagram illustrating means different from those shown in Figure 2 for actuating the limit switches.

Referring to Figure 2, the window raising and lowering mechanism there shown comprises a vertically movable support *a* on which rests or is secured the lower edge of a window *b*. This support is connected by a pair of parallel links *d* to a horizontally slidable member *d'* movable along a guide *e* in the main plate *f* of the mechanism, this plate being adapted to be secured in a vehicle door or in any other part of the vehicle body beneath the window. On this plate is pivoted a lever arm *g* which at its outer end is pivotally attached to one of the links *d*, and to the pivot spindle *h* of the arm is secured a toothed sector *i* which is engaged by a pinion *j* mounted on the plate. Also to the spindle *h* is secured a short arm *k* to the outer end of which is secured a counter balancing spring *l*. The pinion *j* has formed with it a worm wheel *m*, and this latter is engaged by a worm *n* on the spindle *o* of the armature *p* of a small reversible electric motor *p'* carried by the plate *f*. Alternatively the armature spindle may be connected to the worm

through a flexible shaft.

Instead of the parts above described any other suitable link or lever system may be employed for transmitting motion from the motor to the window.

For controlling the motor, which is supplied with current from an electric storage battery or any other convenient source, we employ (in one embodiment of our invention) the circuit and switching means illustrated by Figure 1. In this Figure the motor armature is represented by *p*, the field windings by *q*, and the supply battery by *r*, the motor illustrated being of the series type. In the portion of the motor circuit between the field windings and armature, is arranged a motor controlling and reversing switch *s*. This is adapted to be operated by hand and may be of any convenient construction. As is usual in so-called reversing switches it is provided with six fixed contacts as shown. The two middle ones are connected to the field windings and source of supply. Each of the two end pairs are diagonally interconnected and one of each pair is connected to the motor armature. In association with these contacts is arranged a hand operable rocker (not shown) whereby the middle contacts can be connected to either of the end pairs of contacts. Movement of the rocker in either direction from its normal or open position causes the motor circuit to be closed, and the direction of rotation of the motor is determined by direction of movement of the rocker. The mode of connection of the middle contacts to one end pair of contacts by the rocker is indicated by the dotted lines in the figure. To effect reverse rotation the rocker is moved in the opposite direction so that it then connects the middle contacts to the other end pair. When the rocker is released it is returned to its initial or open position by a spring. Instead of a rocker a pair of push buttons could be used.

To minimise wastage of electric current and risk of overheating of the motor by the current due to the user keeping the switch closed for a greater time than is necessary, an automatic limit switch *t* is provided in each of the diagonal connections between the two end pairs of fixed contacts of the motor controlling and reversing switch *s*, one of these limit switches being adapted to be opened when the window reaches its upper position and the other when the window reaches its lower position. Assuming that it is desired to open a window and that this requires movement of the rocker in the direction in which it connects the two middle contacts with the

two upper end contacts (as illustrated by the dotted lines in Figure 1) this causes the motor to be set in motion in the appropriate direction. When the window reaches its lower limit of movement the lower limit switch *t* is opened thereby causing the motor to stop. But the upper limit switch *t* remains closed. Consequently when it is subsequently desired to close the window and the switch rocker is moved in the appropriate direction, (that is to say the direction in which it joins the middle contacts to the two lower end contacts), the motor is again set in operation. As soon as the previously operated limit switch *t* is released by this reverse movement of the mechanism it closes under the action of a spring, and when the window reaches its upper position the other limit switch is opened for stopping the motor.

The limit switches *t*, which may be of any convenient construction, are adapted to be actuated by any convenient part of the window operating mechanism. Figure 2 illustrates one of a variety of possible means for actuating the limit switches. In this example, the two limit switches *t* are adjustably mounted on the plate *f* adjacent to the sector *i*. Each switch comprises a resilient blade *u* fixed at one end and carrying a contact *v* which is biased by the resiliency of the blade towards a position in which it touches a fixed contact *w*. The free end of the blade is adapted to be engaged by one edge of the sector *i* or a projection on the sector, the arrangement being such that the appropriate switch is opened when the sector (and consequently the window) arrives at either of its limit positions. It will be apparent that any other convenient part of the mechanism could be utilised for actuating the limit switches. By means of these switches the motor circuit is opened automatically when the window reaches either limit of its movement. If it is desired to arrest the window in any intermediate position it is merely necessary for the user to release the hand operated switch *s*.

Another mode of controlling the limit switches is illustrated at Figure 3. Here the armature spindle of the motor is utilised for that purpose. The armature is indicated by 2 and its spindle 3 is free to move endwise in either direction for a sufficient distance against the controlling action of strong springs 4. Adjacent to each end of the spindle is arranged a limit switch *t* as above described. Each of these comprises a resilient blade *u*, carrying a contact *v* which co-operates with a fixed contact

*w*. Normally the armature 2 is held in its central position by the springs 4. But when due to the arrival of the window at either limit of its movement the motor experiences the consequential increased resistance to its rotation, the worm *n* screws along the worm wheel *m* causing the armature spindle to move endwise and open the corresponding limit switch *t*.

It will be understood that the invention is not limited to the examples above described. Further, as regards the hand operated switch this may be mounted on the window sill, dash board or in any other convenient position. Moreover the cables required for conveying current to the motor may be arranged in any convenient manner. When it is required to pass the cables through the hinged edge of a door, they may be incorporated with the usual door straps, or contacts may be arranged in the hinges, or in the abutting edges of the door and frame. Whilst the invention is required mainly for use with vertically movable windows it is also applicable to horizontally slidable windows.

By this invention we are able to arrange for the automatic actuation of vehicle windows in a very simple and satisfactory manner.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A vehicle window operating means of the kind specified, comprising the combination of mechanism including a reversible electric motor and a link or lever system through which motion can be imparted to the window, a hand operable switch for directly controlling the supply of current to and the direction of rotation of the motor, and limit switches directly operable by the said mechanism for interrupting the supply of current to the motor when the desired movement of the window in either direction has been completed.

2. A vehicle window operating means as claimed in Claim 1, in which the limit switches are operable by an angularly movable part associated with a lever through which motion can be imparted to the window.

3. A vehicle window operating means as claimed in Claim 1 and having worm gearing for transmitting motion from the motor to the link or lever system, the worm having freedom of axial movement, and the limit switches being responsive to axial movement of the worm.

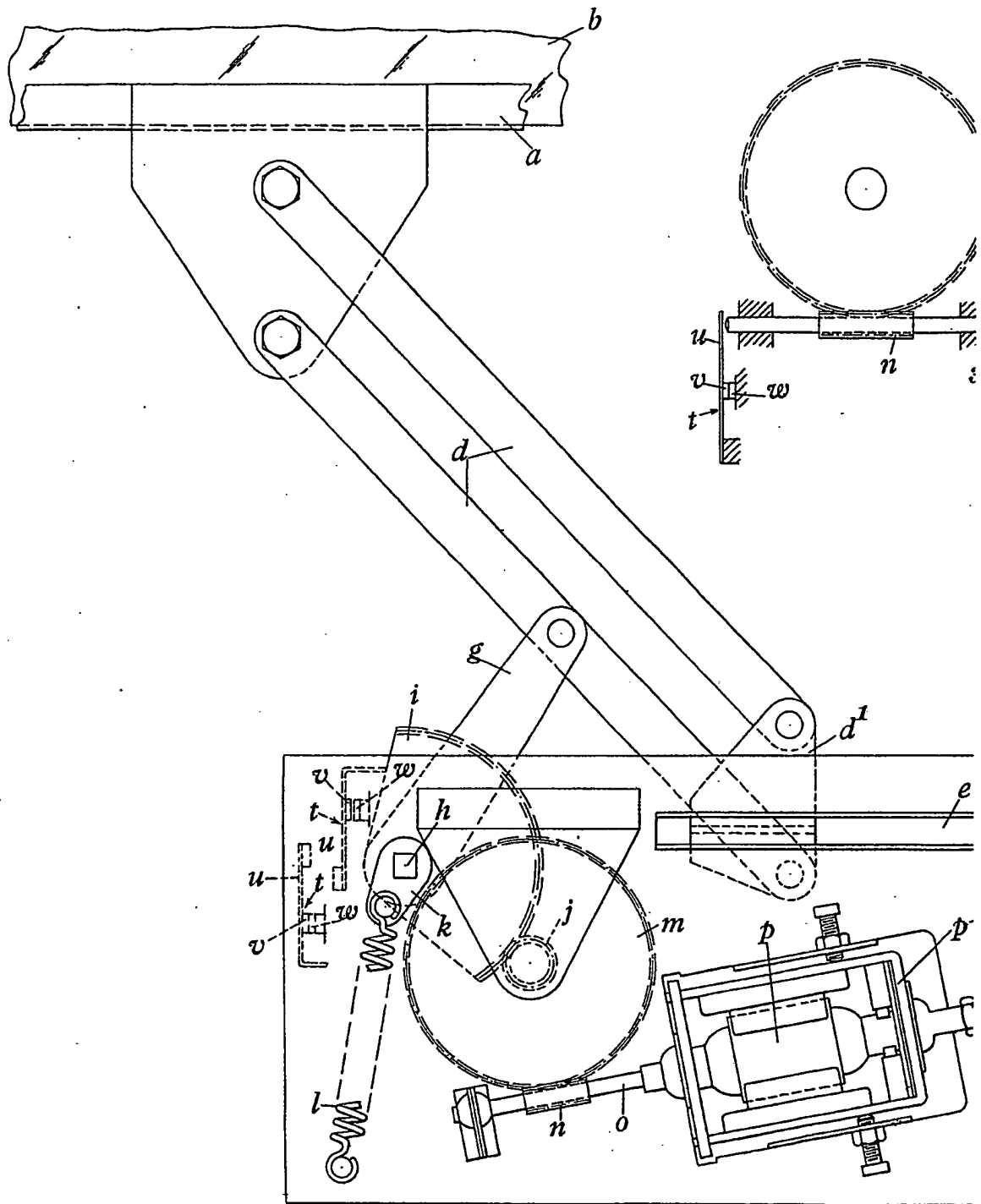
4. A vehicle window operating means as claimed in Claim 1 and comprising the combination and arrangement of parts substantially as described and as illustrated in Figures 2 or 3 of the accompanying drawings.

Dated this 10th day of January, 1943.

MARKS & CLERK.

Leamington Spa: Printed for His Majesty's Stationery Office, by the Courier Press.—1942.

[This Drawing is a reproduction of the Original on a reduced scale.]



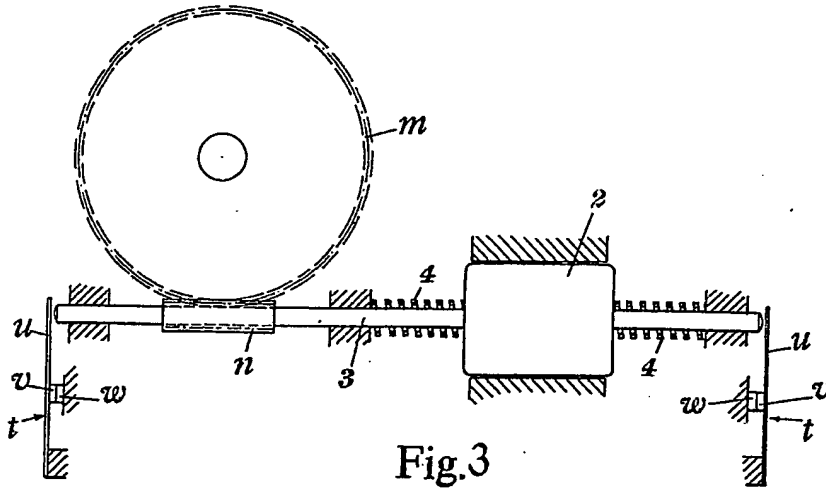


Fig. 3

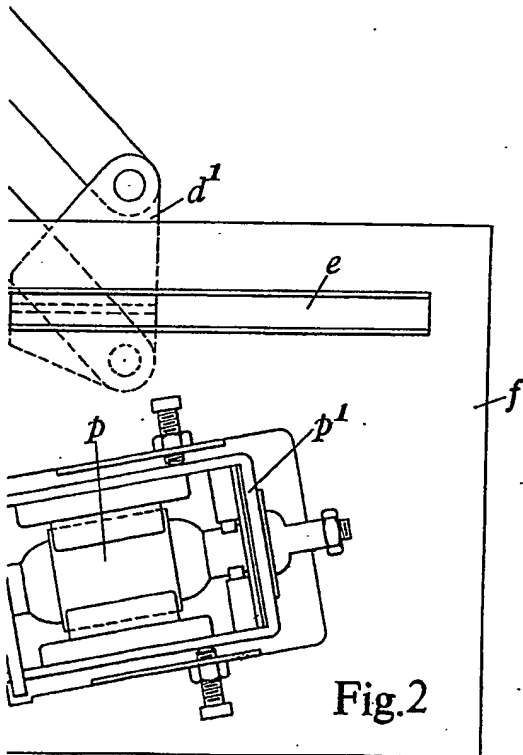


Fig. 2

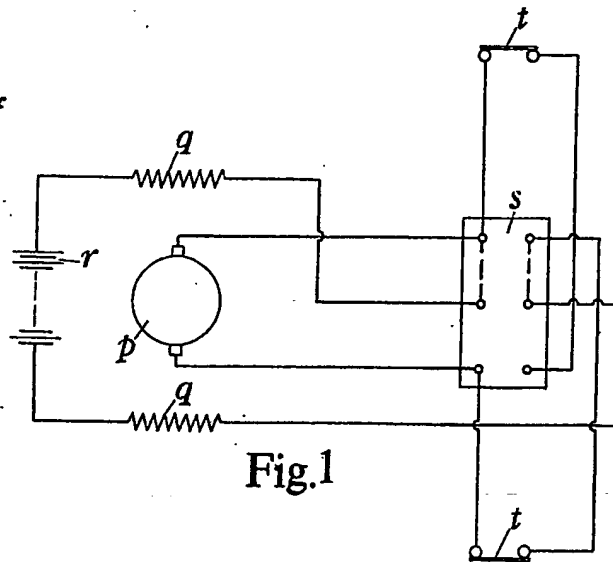


Fig. 1

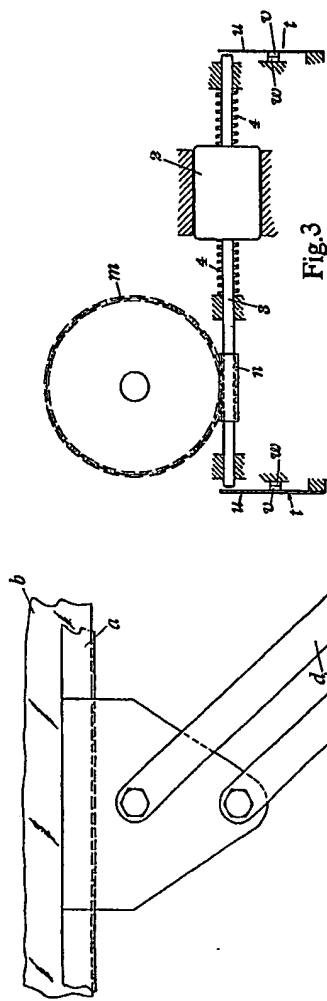


Fig. 3

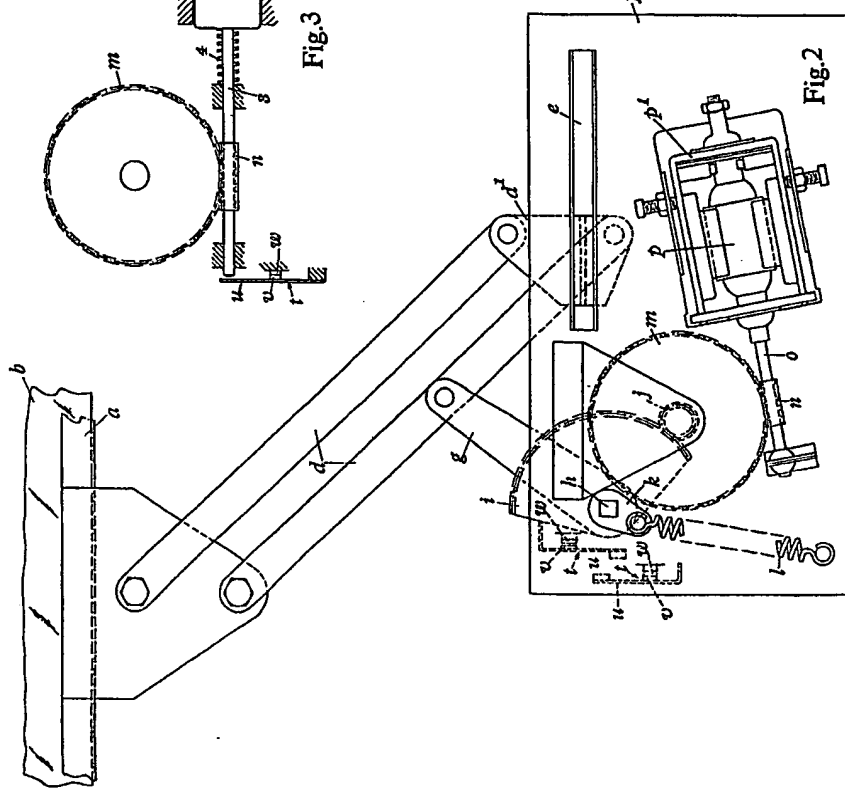


Fig. 2

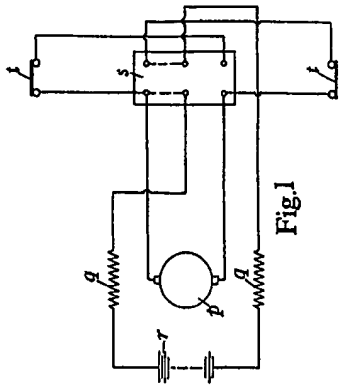


Fig. 1

[This Drawing is a reproduction of the Original on a reduced scale]